ALEXANDER B. RUDIN

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OBJECTIVE

Highly motivated multi-disciplinary engineering graduate student seeking my next opportunity to develop critical cyber-physical and automated systems by utilizing my joint mechanical engineering and computer science background, and my experience working in and managing a variety of project environments. I am particularly excited by applying robust software algorithms to physical systems, and am looking for ways to explore that space.

EDUCATION

University of Virginia, **School of Engineering and Applied Science**   Charlottesville, VA

Masters of Engineering in Mechanical Engineering   Concentration: Cyber-Physical Systems   Expected May 2021

- **Cumulative GPA: 3.94**

B.S. with Highest Distinction in Mechanical Engineering   Minor: Computer Science   May 2020

- **Cumulative GPA: 3.89**

EXPERIENCE

Perrone Robotics, Inc. – *Systems Engineering Intern* – Crozet, VA   August – November 2020

- Constructed a design structure matrix analysis on network and power requirements to optimize component layout for retrofit autonomous electric vehicle systems
- Sourced components and used SolidWorks and Fusion360 to model custom componentry for retrofit mounting hardware
- Built an automated platform in Python to create design structure matrix models of system diagrams and report key insights

Metallum3D, Inc. – *Controls and Embedded Software Engineer* – Charlottesville, VA   March – July 2020

- Led system integration efforts between HMI, control systems, and embedded software for FDM and Binder-Jetting 3D printer post-processing furnace system
- Developed a Fuzzy Logic temperature control algorithm in Python and rebuilt in C++ for production which reduced RMSE by 2 degrees over previous PID system
- Created a hardware-in-the-loop simulator in C++ for a temperature control system retrieving temperature data from pyrometers and adjusting output of a set of magnetrons

Zeta Associates, Inc. – *Software Development Intern* – Fairfax, VA   May – August 2019

- Scheduled, divided work, and planned weekly workflow for team of 3 interns to substantially complete project during 10-week internship
- Built, tested, and benchmarked production-level code for a digital signal processing algorithm in Python
- Utilized CUDA library with NVIDIA GPUs to reduce runtime by 3x over single CPU runtime
- Generated ICD for the project to clarify use cases and procedure as well as to ease transition process

Clark Construction Group, LLC – *Research & Development Intern* – Bethesda, MD   May – August 2018

- Implemented an interface with SQL and node.js used by project teams to automate sending requisitions and Release of Liens to subcontractors to save Jobsite Superintendents 20 hours of work per month
- Used HTML/CSS/JavaScript to develop a series of maps for displaying and manipulating pertinent jobsite and material yard data to improve project scheduling and material shipping
- Utilized Excel, d3.js and Google Data Studio to create project dashboards for update meetings with clients

Windpact, Inc. – *Engineering and Design Intern* – Leesburg, VA   May 2017 – January 2018

- Developed CAD models in Solidworks for vacuum form molds and CNC machined and post-processed the molds
- Analyzed foam and pad prototypes throughout testing process from foam hardness testing to drop testing to full-helmet headform testing for NOCSAE standards
- Designed in-house drop testing system, generated BOM, and sourced components
- Used Excel to develop Cost Calculator for pad prototypes in order to hold discussions with possible clients

PROJECTS

Estimation and Trajectory Planning for a Frogger Robot – SYS 6581 (Autonomous Mobile Robots)   December 2020
- Used ROS with Python to process and fuse LIDAR data to estimate positions and velocities of an arbitrary number of traffic robots in the environment
- Utilized an MPC-style potential field obstacle avoidance algorithm to plan the trajectory of the ego robot based on the predicted positions of the traffic robots to move safely from start position to goal
- Used Gazebo and rviz to construct a world for the ego robot with random motions for an arbitrary number of traffic robots and to collect and visualize data from each run of the ego robot

Machine Learning Analysis of Trumpet Playing Motion – CS 6501 (Signal Processing, ML, and Control) November 2020
- Collected accelerometer and gyroscope data from Android Smartwatch and automated a Python data cleaning pipeline for feature extraction
- Processed data with a WEKA decision tree classifier, random forest classifier, and SVM and achieved 96% accuracy with both the decision tree and the random forest
- Created a feature selection algorithm to reduce the initial 24 features down to the most pertinent four features, which matched 96% accuracy but with much lower time and memory complexity

Construction of Kalman Filter and Particle Filter – SYS 6581 (Autonomous Mobile Robots)   October 2020
- Built a Kalman Filter in MATLAB using two GPS sensors and controller input all modeled with Gaussian noise
- Created a Particle Filter for robot localization using 6 landmarks in the space for convergence of the algorithm after 10 steps of the robot pose

Machine Learning Analysis of Hand Washing Motion – CS 6501 (Signal Processing, ML, and Control)   October 2020
- Collected accelerometer data from Android Smartwatch and automated a Python data cleaning pipeline for feature extraction
- Processed data with a WEKA decision tree classifier and achieved 96% accuracy, 97% precision, and 97% recall on a 5-fold cross validation

Control and Simulation of non-Holonomic Robot Behaviors – SYS 6581 (Autonomous Mobile Robots) September 2020
- Modeled and tuned control algorithms for go-to-goal, follow-a-wall, and follow-a-path behaviors with ROS with Python
- Used MATLAB to model a potential field obstacle avoidance algorithm and simulated behavior for both holonomic and non-holonomic vehicle dynamics

Magnetically-Actuated Ferrofluid Clock – Capstone MAE 4610/4620   August – December 2019
- Maintained Gantt Chart for project scheduling and adjusted weekly tasks to complete project in 3-month timeframe
- Used Parallax microcontroller with mechatronic servomotor system and Parallax LCD screen to implement user interface
- Designed, built, and tested numerous prototypes utilizing Solidworks and Catalyst software with FDM 3D printers and laser cutters

SKILLS

Arduino, Autodesk Fusion, Certified Solidworks Associate (CSWA), MATLAB, ROS
C++, Python, Java, HTML/CSS/JavaScript, Scikit-Learn, Keras Tensorflow, WEKA, InfluxDB, Microsoft Office Suite
Critical Thinking, Leadership, Problem Solving, Project Scheduling, Written Communication

COURSES

Mechanical:	Mechanical Systems; Heat and Mass Transfer; Mechatronics
	Modeling + Control of Manufacturing Processes; Autonomous Mobile Robotics; Fluid Dynamics
Computer Science:	Discrete Mathematics; Program and Data Representation; Algorithms; Machine Learning
	Signal Processing, Machine Learning, and Control

LEADERSHIP & EXTRACURRICULAR ACTIVITIES

The Haven Day Shelter, *COVID Task Force Volunteer*
UVa ULink Peer Advising, *Adviser*   August 2017 – May 2020
UVa Club Ultimate Frisbee, *VP (*2018 – 2019)*, Captain (*2019 – 2020)   August 2016 – May 2020
UVa Jazz Ensemble   August 2016 – May 2019

AWARDS

Pi Tau Sigma Mechanical Engineering Honor Society	September 2018 – present
Tau Beta Pi Engineering Honor Society	October 2018 – present
UVa Intermediate Honors Recipient (top 20% of engineering school class)	October 2018
Finalist for UVa Entrepreneurship Cup Concept Competition	November 2016